

USAWC STRATEGY RESEARCH PROJECT

OPTIMIZING JOINT ENGINEERING SUPPORT

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ABSTRACT

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As service components are tasked to provide engineers to both Operations IRAQI FREEDOM (OIF) and ENDURING FREEDOM (OEF), it is imperative that each service provide trained engineers capable of interoperability with common understanding and skill sets to support ongoing and future missions. This study will look at existing conditions and lessons learned to improve joint engineering capabilities. This paper will examine ways to improve organizing, training, resourcing, and command and control strategies to optimize engineering forces provided to the combatant commander.

OPTIMIZING JOINT ENGINEER SUPPORT

Operations ENDURING FREEDOM (OEF) and IRAQI FREEDOM (OIF) have provided numerous and significant lessons for which we must incorporate into joint doctrine, training methodology and equipping strategies to optimize response for future engagements. Within the engineer community, the combatant commander staffs, the component service staffs, and each service's respective headquarters staffs have observed various strengths and weaknesses of joint engineer operations while also gaining levels of understanding of other services' capabilities that was not resident within the collective engineer community. Given this opportunity for enlightenment, the joint engineer community needs to formalize and further enhance opportunities which were uncovered as a result of engineering practices in OEF and OIF. This paper will look at ways to improve organizing, training, resourcing, and command and control strategies to optimize engineer forces provided to the combatant commander.

The challenges that military engineers realized in OEF and OIF were resultant of lack of service interoperability and familiarity of inter-service capability. This was a result of the independent missions and specialized capabilities created during and following the Cold War.¹ However, its origin developed when engineer support required during the Korean Conflict and the Vietnam War was overtasked and could not be provided to each service predominantly by Army engineer units.² The result was each service developing a level of organic engineering capability to basically equip and train to support their respective missions. So, why didn't the Goldwater Nichols Department of Defense Reorganization Act of 1986³ correct this service independence? The act stated in its policy the intent to strengthen the civilian authority in the department and improve advice provided the President and his National Security Council by providing specified and unified combatant commanders the responsibility and authority to accomplish their assigned missions.⁴ This legislation did have lasting impact on the department by specifically ensuring "the unified commanders are vastly more capable of fulfilling their warfighting roles."⁵ While the legislation has accomplished much, it was really the combat functions of each service which transformed into more effective joint operations, while combat support operations lagged. The lessons observed in OEF and OIF illustrate the need to further advance the cause within the engineer force.

Review of studies, books, articles, lessons learned, and personal accounts of engineer support activities within and across services have highlighted areas which can be optimized. Our engineers in the field have responded to overcome many obstacles that can, with some additional attention, be eliminated to enhance capabilities of engineer forces along with better

utilization of existing capabilities. Additionally, private sector capabilities have been a part of the engineer tool box for well over a decade and should be leveraged to complement military engineer core capabilities. The five focus areas analyzed in this paper to optimize the joint engineer force are: 1) organizational; 2) training (both technical and professional); 3) equipping; 4) contractor support; and 5) joint command and control (C2)/Joint officer development.

Engineer Organization

The effort of each service to provide engineer support for each respective mission became that of necessity over time. Overtasking of US Army (USA) engineers during Vietnam, coupled with follow-on active duty end strength cuts, contributed to organic capabilities being created or built up in the US Air Force⁶ (USAF) and US Navy⁷ (USN). As the size of the USA was capped, certain functions had to be cut or moved to the reserve component, realizing there was some risk in doing so.⁸ However, the entire joint engineer function was affected by the accepted risk.⁹ During Operations PROVIDE COMFORT and JOINT ENDEAVOR, joint tasking became more common due to shortfalls within services,¹⁰ as did the use of contractors for support in areas where there were engineer capability (or experience) shortfalls. During OEF and OIF, the necessity of contractors further highlighted the need to improve our joint engineer capability. Our engineers had to rely too frequently on solely their “hard work and quick thinking in the field to overcome significant deficiencies in their ability to deploy quickly and provide a timely, effective response to operational requirements.”¹¹

Recent taskings of engineers from other services to support normally organic Army engineer missions highlight the need to better understand each other's requirements and processes.¹² More importantly the emphasis needs to be placed on capturing the successes and failures into executable plans to hold onto the gained interoperability lessons and cultivate additional gains among services.

Organizing units of any specialty or capability is essentially a responsibility of each service per Title 10 requirements. Engineering is no different, and as a result, service specific engineer requirements have resulted in some fairly significant varying roles and, therefore, capabilities. Each service's engineer units and their associated capabilities are summarized to provide better understanding for use in joint and multinational operations in Appendix A of Joint Publication 3-34, Engineer Doctrine for Joint Operations.¹³ While this provides insight into the general capabilities of each service's engineer forces, Joint Publication 4-04, Joint Doctrine for Civil Engineering Support, provides some additional detail to better understand specific operations for which each service is prepared to conduct.¹⁴ These appendices also highlight the

differences in engineer abilities between service branches, which can be viewed both positively and negatively. The Army's combat heavy units pack with them a lot of capability that allows them to successfully accomplish a wide range of tasks; this has resulted in their not having the organizational flexibility to accomplish smaller missions. Consequently, Navy and Air Force engineers are typically tasked to tailor lighter engineer units, which require less lift, to provide support for specific missions.¹⁵ In recognition of this difference, the Army has elected to reorganize their engineer forces by "embedding an engineer company in the Brigade Combat Teams (BCTs) and force-pooling the remaining engineers above the division for maximum flexibility in task organizing for an undetermined type of fight."¹⁶ Tailoring of the force can be accomplished to sub-unit levels that can be re-assembled to preserve the total capability of the unit, or in its smallest components, to guarantee agility for time-sensitive missions. This will not be an easy task but if done correctly will allow greater dexterity without sacrificing a robust capacity.

Another consideration to the organizational constraints is the mix of active and reserve component forces within each service. "Organizational adaptation will require actions to balance Active and Reserve Components to sustain an appropriate mix of capabilities."¹⁷ The mix is determined by each service based upon many variables, to include requirements, cost, personnel authorizations, competing mission priorities, and so forth. Between 25% to 80% of the joint engineers reside in the reserve component of their respective service.¹⁸ Therefore, a great percentage of the engineer force availability will be dependent upon presidential call up authority, DoD policy, and the state of readiness of the reserve component depending on other variables. To further compound the use of the reserve component is the possible problems of employer fatigue and individual reservist fatigue regarding continual deployments. These problems are being born out with some National Guard units falling short of their annual recruiting goals by more than 20 percent and families gathering signatures opposing 12-month tours.¹⁹ Additionally, Department of Defense (DoD) policy limits on Reservists' involuntary service and sets policy that has reduced the band of eligible personnel that can be deployed.²⁰ Therefore, it is evident that the makeup of the force can and does have implications on the dwell time of high operations tempo (OPTEMPO) of certain deploying units. Each service determines engineer requirements and the makeup of those forces is independent of other services and does not have considerable joint oversight. Recent and ongoing transformation initiatives in the Army and Air Force may have a capabilities impact to the joint engineer force. While attempts are made to minimize the impact of such transformation on combat and expeditionary

operations, they have to be weighed against in-garrison needs as well as other combat capabilities.²¹

A further consideration to the mix of active and reserve component forces should be to sizing and tasking of the reserve component forces into flexible sub-unit levels. Deliberately moving targeted, smaller sub-unit tasks to the reserve component may better allow these units to “fill out” sub-unit tasks on a volunteer basis.²² Essentially this “transformational concept” allows units to break out, where possible and practical, into sub-unit modules that can be deployed to accomplish smaller tasks such as engineer sustainment missions.²³ The process will require an extensive in-depth analysis of a multitude of capabilities as well the individual team compositions of each to identify potential candidate sub-unit modules.²⁴ Albeit difficult and tedious, this “transformational concept” could potentially mitigate the reserve component’s limitations on restricted call up while taking advantage of those volunteers that may be able to fill smaller taskings that otherwise would be tasked to the active component.²⁵

Additionally, leadership should question whether the increasing operations tempo within our current force during prolonged engagements such as OIF and OEF will have impacts similar to what was observed in Vietnam. Although today’s all volunteer force will likely be able to stave off the emotional impacts longer than observed with the Vietnam era draft force, there will eventually be a negative impact as the long war continues.²⁶ In fact, the Chief of Naval Operations indicated that one of the specialties that had low dwell times (in the 1:1 range) that need to be improved (to the 2:1 range) were the USN Seabees.²⁷ Therefore, great caution should be placed on weakening the joint engineer force capability within the Department of Defense (DoD) to ensure mission essential tasks are ensured in the time and place that they are required. Failure to do so may leave a gap within DoD which contractor resources will be unlikely to fill in a timely manner.

Engineer Training Operations

Different service cultures have developed skill sets that differ greatly within each branch. As a result, mediums as basic as language have impacted interoperability between services.²⁸ Additionally, USA and Marine engineers train extensively on combat skills while USN Seabees spend more training on core construction competencies²⁹ as do Air Force engineers. The reasons for the differences are culturally founded as the former service units function primarily as combat units while the latter as construction units.³⁰ While there is nothing right nor wrong about either approach, it highlights some variations that need to be realized to ensure survivability, as well as joint mission success.

Having personally spoken with many Air Force engineers that had completed “in-lieu of” taskings to support USA missions in OIF and OEF, I concluded that some training initiatives that were implemented within the last 2½ years have proven invaluable. The Combat Skills Training (CST) conducted prior to troop deployments is an example of such training. The training covers use of “basic Army small-unit equipment such as Single-Channel Ground-to-Air Radio System (SINCGARS), frequency modulated (FM) radio, and Precision Lightweight Global Positioning System (GPS) receiver (PLGR),”³¹ as well as Combat Lifesaver and a robust small arms/crew weapons training.³² This Army training has been a major success to fill a vital gap in combat skills that had not existed in sister service units. The recognition of this lack of core skills by Air Force leaders has resulted in their basic training course to be extended to help narrow the combat gap.³³ Initiatives like these are creating a more joint force by increasing interoperability amongst branches, and are integral to continued joint success.

Training initiatives that are already in place are a reasonable start that needs to continue to be emphasized and supported, even after OEF and OIF are complete. But further innovations need to be put in place to fill the gap of knowledge-based interoperability of engineers. Before OEF and OIF, young engineer officers and non-commissioned officers (NCOs) from different services knew very little about their sister services corresponding engineer capabilities. If so motivated, they could read Joint Pubs 3-34 and 4-0 which would provide several paragraphs about organization capability, but nothing compared to the hands-on experience gained during recent deployments within theater. For it isn’t until engineers actually experience other engineer unit’s specialized missions do they actually gain an understanding of their capability.³⁴ In Europe there is an introductory course for our engineers to acquire NATO engineer understanding but we don’t have the same type of instruction for our engineers between services.³⁵ While the need for such a capability is transparently clear, it is reinforced in the 2004 National Military Strategy. “For junior officers and noncommissioned officers, incorporating joint education and training early in their careers ensures future leaders will more effectively integrate tactical operations with interagency and multinational components.”³⁶ It has been stated that such training needs to encompass technical, tactical, and conceptual skills that will go along with interpersonal skills of each engineer officer/NCO in the joint arena.³⁷ Fort Leonard Wood, Sheppard AFB, and Eglin AFB technical schools are successful examples of joint training centers for engineer personnel across the services. Following such joint technical training, troops readily develop basic understanding of their own service’s engineer capabilities, but have no insight into their service counterpart’s aptitude. To fill this void there needs to be some training at the NCO and junior officer level in the organizational understanding of the other

services' engineer units. The culmination of such a training and exercise program will be three-fold. It will first provide better tactical understanding of engineers and interoperability of troops working alongside each other in the field. It will also grow engineers, giving them the ability to function at the operational level in joint and multinational task forces to optimize engineer capability in theater. Finally, engineers at the Senior NCO, field grade, and senior officer level will have extensive understanding of capabilities and force structure to proficiently conduct deliberate and crisis action planning. They will also gain a better awareness of the joint engineer environment and subsequent responses due to future resourcing strategies.

In response to this need, the Joint Operational Engineering Board (JOEB) created the Joint Engineer Officer Course (JEOC) and developed an outline for a pilot course that was conducted in June 2006.³⁸ The JEOC curriculum consists of 48-hours of distance learning lessons and 32-hours of in-residence lessons which include several practical exercises geared at resembling realistic joint task force (JTF) scenarios. The goal of the JEOC is for engineers to grasp the capabilities of other service's engineer units and leverage them to accomplish the JTF mission.³⁹ Initial feedback from the JEOC is still coming back from the two classes that have been held thus far as the course directors obtain feedback on the last day of the resident phase as well as 90, 180, and 365 days after completion.⁴⁰ While this course is having an immediate impact, constant evaluations and updates are paramount to the relevance and currency of the dynamic engineer mission. If done properly, this course and the curriculum should continue to enhance the ability of military engineers to accomplish the aims outlined in the 2004 National Military Strategy as noted above.

Equipping

Equipping engineers is a most critical aspect of ensuring the engineer mission can be successfully accomplished within critical timelines. In general, engineers require a significant amount of equipment and material to accomplish their mission. Therefore, an Achilles heel for joint engineers is moving that capability to its terminal location quickly. "How quickly engineers can get to the fight is determined by three basic transportation factors – size and weight, distance, and speed."⁴¹ Since lift is not a variable that engineers have much control over and it's usually in shorter supply than demand, speed is not a variable that offers much control of influence in this discussion. This leaves size, weight, and distance. These variables are severely restrained by physics and geography, but do have some potential for manipulation.⁴²

First, considering the size/weight variable one must look at what factors can be controlled to reduce the size and weight of engineer equipment. Since many engineer operations require

significant earthmoving capability and other support equipment to accomplish their mission, the physical dimensions and weight of the equipment is necessary to accomplish the task.⁴³ So, any improvements to significantly reduce equipment weight will likely have comparable degradation in construction capability. Another method of reducing the weight of equipment is to only take the absolute minimum mission essential amount required for the task at hand. This of course validates and re-emphasizes the initiative above to modularize and tailor construction units to specific tasks or capabilities which requires less lift. While not a guarantee to improve delivery dates of equipment, it will improve chances and also reduce overall theater lift requirements.

The second variable to be considered is distance and what can be done about reducing the distance to improve delivery times of engineer equipment. Certainly one method of accomplishing this is by continuing to use pre-position equipment close to where it's anticipated to be used. This strategy was far easier during the "Cold War" as the location of the battlefield was essentially pre-determined, so that large War Readiness Material (WRM) were pre-positioned in the European theater. That location is less predictable in today's environment. Thomas P. M. Barnett mapped all U.S. military responses following the "Cold War" and found by drawing a line around 95% of the responses the encircled region was a rather large area (close to 50% of the global land mass).⁴⁴ While Barnett's map provides a daunting picture to overcome, by carefully scanning the crisis points it does reveal that there are a few areas of the world that have higher concentrations of crisis response than others. Fortunately, the military has used a couple of these regions to preposition WRM assets. Although this helps the engineers, one problem with pre-positioning remains; much of the pre-positioned fleet is difficult to maintain,⁴⁵ or "worn out and beyond its normal life expectancy."⁴⁶ "Across the services and around the world, engineer equipment replacement has generally been undercapitalized for an extended period of time."⁴⁷

Pre-positioning WRM equipment has three elements which are problematic to engineer readiness and capability: the location of the WRM prepo site; the state of maintenance/readiness; and the age of the equipment. A report prepared for the Joint Staff J-4 Engineer Division in 2002 entitled "Capabilities Analysis Engineer Capabilities Study: A Path to the Future" introduces a concept to create "mini-depots."⁴⁸ "The mini-depot concept is intended to complement existing PREPO stocks, not replace them."⁴⁹ The concept utilizes the existing service contracts (LOGCAP/AFCAP/CONCAP) to lease and maintain equipment near designated areas of responsibility (AORs) which will then be transported to the aerial port or sea port of arriving engineer units to provide them core construction equipment for initial, critical

construction tasks.⁵⁰ Of course there is a cost associated with implementing the “mini-depot” concept which could potentially be offset by the cost reduction/avoidance of lift from the “mini-depot” vice home station. However, even if the cost/benefit is validated, there would be increases in operations and maintenance funds which offer only a potential for future savings when/if engineers use the equipment for contingency or wartime operations.⁵¹ This of course poses some peacetime programming and justification challenges that are not likely achievable without a corresponding budgetary offset.

While the “mini-depot” concept may have budgetary liabilities, there may be some room to leverage the service contracts to prepare to execute contingency contracts to provide necessary equipment (and capabilities) in various AORs. Expanding the use of one or more of the service contractors could further capitalize upon the use of existing construction and equipment businesses in the region to leverage existing equipment that may be available to fill equipment sets for time-sensitive engineer projects in the theater. This concept is similar to contingency response plans most DoD installations have available at home station in order to expediently locate and lease critical equipment and engineer capabilities during crisis response or natural disaster. It may not be the ideal solution, but can provide an interim solution to facilitate certain engineer task completion.

A long term aspect of equipping the engineer force that needs to be implemented, where possible, is to leverage logistics support capability and interoperability between services by acquiring common assets. While there may be service unique equipment requirements, there are opportunities to not only standardize the fleet for interoperability reasons, but for quantity discounts to be realized if all services agreed to create pure joint fleets.⁵² Additionally, standardizing beddown facilities between services will afford the similar efficiencies as noted for the fleets above.⁵³ Services should continue to “conduct basic applied research and advanced technology development programs in military engineering, battlespace environment and environmental quality technology and installations”⁵⁴ while leveraging the private sector and all commercial technological advances that can move ahead general engineering capability. Each and every gain in ability to ensure the right amount of lighter interoperable equipment gets to the time critical mission area reduces further risk and improves the probability of mission success.

Contractor Support

The presence of contractors providing engineer support has steadily increased since the first major infusion observed following Desert Shield/Desert Storm and has reached a level of effort that few could have predicted. The fact is that these contractors are providing support and

have broad capabilities that are being extensively tapped and which should be leveraged to fill future gaps while providing specialized expertise where none existed within the military. Equipment leasing and delivery mentioned above is one possible application of contractor leverage to provide a time-sensitive capability. There are some technical skills such as well drilling, pile driving, and batch plant operations that are perishable skills which could potentially be candidates for outsourcing to service contractors.⁵⁵ Selecting such less critical, perishable skills to be outsourced will allow military engineers to focus their training and proficiency on other, more critical, core skills.⁵⁶ Given our exposure to the OEF and OIF theaters, our engineers have had ample opportunities to observe contractor performance in a variety of engineer tasks. Engineers throughout the region should be able to evaluate cost and performance, as well as evaluate the value of task avoidance for military engineers, to begin applying recommendations for future outsourcing recommendations. Incorporating inputs directly from engineer commanders' assessments into a task matrix could be helpful in providing recommended tasks for contract engineer consideration in the future. Such a matrix could be managed in a similar manner as the Gulf Regional District has managed 1,000 U.S. subcontractors and 1,600 host nation firms in the rebuilding of Iraq.⁵⁷ Of course this matrix would need to be carefully developed and scrutinized to ensure security and mission essential tasks are protected. However, tapping into in-place regional engineer potential will leverage capability already in theater and reduce the competition for heavy lift for that portion of engineer equipment.

Joint Command and Control (C2)/Joint Officer Development

Engineer support in OEF and OIF caused some operational and developmental issues to be addressed and fixed in the field to accomplish the mission. The engineer career field is fortunately very adept at assessing various types of problems and developing solutions to allow accomplishment of the mission. Due to the duration of the actions in Afghanistan and Iraq, some of the changes and solutions that were made through the C2 and manning of joint task force staffs have been captured for current operations and in the future through the re-write of Joint Pub 3-34, Joint Engineer Operations. The referenced pub is in draft form and has included many of the organizational and C2 changes as part of the rewrite. The draft shows detail in various service, functional, and subordinate Joint Task Force command relations where virtually none existed before.⁵⁸ The draft publication also introduces geospatial engineering as a discipline that has great potential not only for the engineer to accomplish tasks but for the warfighter as well.⁵⁹ Additionally, reachback capability of each service is identified as a

consideration for supplementary technical advice, as well as planning and design expertise to bring to bear in theater.⁶⁰ The draft pub also highlights the need for a versatile engineer staff that is represented by each service and with individuals who are qualified through appropriate training and experience in joint force engineering.⁶¹ This issue is vital to the success of future joint engineer operations. Capitalizing on learning experiences is paramount for continually improving our joint engineer force. Publishing this guidance, coupled with the ongoing and future efforts of the JEOC training course to create officers and NCOs for joint billets, will be crucial to creating a joint engineer C2 team that can achieve their stride right out of the chute.

The draft pub also dramatically details service engineer capabilities by growing the service engineer organization appendix to include capabilities and expanding it from five pages to twenty-four pages. Each service section creates a more detailed description of the mission and capabilities the units within that service can accomplish. The culminating annex lists engineer capabilities line by line in a matrix format that indicates the level of capacity each respective service can accomplish.⁶² This matrix, and associated service capability information provided in the annexes, will dovetail effectively with the JEOC training to create a significant improvement in preparedness of officers moving into joint jobs. A word of caution concerning the draft joint pub and officer training initiatives, each must remain current as force structure transforms within the services. For instance, the Army and Air Force are currently undergoing transformation and any changes in capability or types of units must be reflected both in the joint publications, as well as the training curriculum to keep the material updated and relevant. This is of utmost importance as our future challenges may not reflect the past successes or lessons learned, so information needs continuous update to provide the knowledge necessary in our engineer toolbox.

Additional Considerations

No matter the duration of current operations in southwest Asia, our engineers need to recognize the changes that have been made by the joint community and understand the importance by which they were made while continuing to focus on improving joint ops. We must guard against the tendency to become complacent and parochial if we benefit from a period of sustained peace in the future. It is during these periods that inter-service relationships will begin to fade, the importance of developing jointly may wane and the peacetime budget realities will force support activities and joint initiatives into remission. Fortunately today's "iron majors" will have learned from their experience and will optimistically stay the course that they had a part in chartering.

Of these concerns, the budgetary constraints will be the toughest to overcome if the United States does enter into an extended period of peace. The ability to develop and sustain current and future initiatives may lose funding as supplemental appropriations shrink, while baseline adjustments to the Program Objective Memorandum cycle will become exceedingly more difficult to defend against other combat systems and vital needs. It will be this environment which most threatens the advances made by the joint engineer community. Keeping joint engineer initiatives on leadership's radar will require vigilance and a matrix that characterizes the associated risk of initiatives if not followed through. The JOEB needs to develop and use such a tool that will capture the inherent risk to the respective combatant commander along with some cost-benefit data that prioritizes such initiatives to quantify the value, versus risk, to proceed with joint engineer initiatives vital to the warfighter.

As budgetary conditions tighten, it is imperative that validated engineer requirements are addressed and identified as limiting factors (if not available or constrained), especially in light of contractor capability. Additionally, constrained forces can not be encumbered by non-critical or non-time sensitive tasks. In the planning process, our joint engineers in the combatant command headquarters must not fall victim to making bad assumptions for convenience due to reduced military capability, or assume host nation or contractor support can provide for any military capability gaps if they are not capable of doing so. Additionally, the active to reserve component mix needs to be considered and accounted for to determine the how, when, and under what circumstances each will be utilized. This is a complex problem with no simple solution, but by using improved tools that are now available, along with some discipline and deliberate planning, an engineer capabilities matrix can be developed to account for each required engineer task.

During this analysis there are numerous references to increasing joint engineer capability awareness as well as some organizational changes that can make units more agile. This should not be misunderstood to mean that each service needs to look alike or have the same core mission set; rather each should utilize their core competencies to strengthen critical capabilities while leveraging the other services to provide either the capability or the training to allow the other services to accomplish specific tasks. Each of the services has reachback capability to organizations that, as stated above, bring specialized expertise to the fight. For instance, the Air Force's Civil Engineer Support Agency (AFCESA) hosted an airfield damage repair (ADR) meeting which was attended by the U.S. Army Corps of Engineers' Engineering Research and Development Center (ERDC), the U.S. Naval Facilities Engineering and Services Center, U.S. Marine Headquarters representatives, and others, to share new technologies.⁶³

“The ADR Working Group established at that meeting provides cross-flow on projects funded by the individual services and major commands and a pool of experts to guide development efforts, and ensures that duplication of effort within the Department of Defense is minimized.”⁶⁴ This one example emphasizes the need for continued coordination, understanding, and knowledge sharing while avoiding duplicating costly effort.

Recommendations

Continue to conduct just-in-time training for inter-service and joint taskings such as the CST course conducted by the Army for Army and Navy personnel deploying for Army in lieu of taskings.

Continue to fund and develop the JEOC to provide distance learning and practical resident programs to develop NCOs and joint engineer officers for the combatant commanders.

Expand the JEOC to provide a basic course to junior engineers to facilitate their understanding of service capabilities at the tactical level.

Expand the JEOC concept to provide NCOs basic level understanding of service engineer capabilities at the tactical level. This may potentially be an opportunity to include joint engineer skill sets in a segment of the enlisted professional military education.

Begin an exchange officer and NCO program between USA Construction Units, USN Seabees, USAF RED HORSE squadrons, and the Marine's Force Service Support Group to improve understanding and increase interoperability between services. This could potentially be a joint billet program opportunity.

Services continue to develop and revise modular, agile engineer structure of their units to allow tailorable engineer capabilities for specific tasks as required by combatant commanders. This continuous initiative should emphasize minimum tailored capability and flexibility to adapt to various missions.

Coordinate with regional and functional combatant commander's engineer staffs to match engineer prioritized requirements with force capability and structure.

Continue to review the force structure necessary to accomplish vital combatant commander engineer tasks. Where possible and practical, assign the reserve component smaller, more flexible modules to leverage the reserve component's ability to source on a volunteer basis.

Refine the reserve component structure where necessary, and develop a deployment methodology within that structure to optimize their activation and use during wartime and contingency operations.

Develop a plan to level the dwell times of the deploying engineer force equitably between services.

Integrate military/civil servant contracting officers into joint planning activities in order to define, without committing the government, the level of contractor support to engineer operations in various sections of the world. The process should be bilateral; to initiate contractor awareness of what is needed so they can prepare to provide; and to recognize contractor capability for use accomplishing non-critical or non-time sensitive tasks. Include these estimates in addition to or in lieu of host nation support in the deliberate planning process.

Energize contractor capabilities to the potential needs for equipment and supplies in various regions of the world to respond to contingencies for their information to initiate non-binding inquiries with local contractors for availability and type of assets that can be provided.

Develop an engineer equipment recapitalization plan to replace worn out vehicles and equipment that is beyond its normal life expectancy.

Where and when possible and practical further develop a “pure fleet” strategy among the services to capitalize on logistics support and economy of scale for purchasing future engineer equipment and vehicles.

Develop a “common beddown” capability between services that will provide a single type of universal troop billets. (Additional service specific facilities, such as industrial and component capabilities packages, can be developed individually.)

Continue to cross-flow developmental engineer efforts across services to encourage inter-service participation and reduce duplication of effort.

Summary

The ability of the engineer community to overcome challenges, service cultures, and understanding has been displayed by our talented and durable officers and engineers in their respective services. As a result they have provided the CENTCOM commander with an engineer capability that is unsurpassed and succeeding without much joint engineer guidance. Now is the time to ensure that our engineers are provided better opportunities to work side by side to leverage capabilities and work to better source and execute missions with lean capabilities and new technologies that are true force multipliers. Capitalizing now will be the investment by which our success will be enhanced in future operations.

Endnotes

¹ HQ USAF/ILEX, "Joint Engineer Roles & Capabilities" briefing slides, April 11, 2003, slides 4-5.

² Ibid, slide 3.

³ Goldwater-Nichols Department of Defense Reorganization Act of 1986, Public Law 99-433, 99th U.S. Congress, October 1, 1986, found at <http://www.ndu.edu/library/goldnich/goldnich.html>.

⁴ Ibid., 3-4.

⁵ John M. Shalikashvili, "Shalikashvili Grades Goldwater-Nichols Progress," SSgt Lee Roberts, *American Forces Information Service News Articles*, December 18, 1996.

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